

CLAIMS

What is claimed is:

1. An electronic module, comprising:
 - an integrated circuit containing components comprising a portion of an electronic circuit;
 - a redistributed surface formed on the integrated circuit, including
 - at least one redistribution layer above at least some portions of a top face of the integrated circuit, which redistribution layer is electrically connected to the integrated circuit and includes at least one conductive trace, at least one mounting pad, and a plurality of interconnect pads, which interconnect pads are positioned along at least one edge of the redistributed surface;
 - a layer of insulation above at least some portions of the redistribution layer;
 - at least one secondary component mounted to the at least one mounting pad and electrically connected to the integrated circuit via the redistributed surface;
 - a substrate including electrical traces of the electronic circuit, wherein a plurality of the traces terminate along at least one edge of the substrate; and
 - wire bonds connecting at least one of the interconnect pads along at least one edge of the redistributed surface and at least one of the traces along at least one edge of the substrate.
2. The electronic module of claim 1 wherein the at least one secondary component is at least one of a diode, a capacitor, a power source, and a coil.
3. The electronic module of claim 2 further comprising additional components electrically connected to the integrated circuit to form a microstimulator electronics package.

4. The electronic module of claim 1 further comprising
a coil comprising a winding around a core;
the core comprising two separate halves;
one core half secured to a portion of the redistributed surface of the integrated circuit; and
one core half secured to a portion of the substrate.
5. The electronic module of claim 4 wherein the core, when the two halves are assembled, is a dumbbell shape.
6. The electronic module of claim 4 wherein the at least one mounting pad is positioned at one end of the redistributed surface.
7. The electronic module of claim 1 further comprising
a substrate including electrical traces of the electronic circuit, wherein
at least one trace terminates along at least one edge of the substrate, and
at least one wire bond connecting the at least one secondary component mounted to the at least one mounting pad and the at least one trace along at least one edge of the substrate.
8. The electronic module of claim 1 wherein the redistributed surface comprises at least one of copper, polyimide, gold, and titanium tungsten.
9. The electronic module of claim 1 further comprising a first layer of insulation on at least some portions of the top face of the integrated circuit.
10. The electronic module of claim 9 wherein the redistribution layer includes:
a first layer of bond material on at least some portions of the integrated circuit;

a layer of conductive redistribution material on at least portions of the first bond layer; and

a second layer of bond material on at least some portions of the redistribution material.

11. The electronic module of claim 10 wherein the first bond layer covers portions of the integrated circuit and portions of the first insulation layer, and wherein the conductive redistribution material covers the first bond layer, and wherein the second bond layer covers the redistribution material.

12. The electronic module of claim 9 further comprising:
a grounding layer comprising at least a layer of shielding material above at least some portions of the integrated circuit.

13. The electronic module of claim 12 wherein the grounding layer includes:
a first layer of grounding bond material on at least some portions of the integrated circuit;
a layer of shielding material on at least some portions of the first grounding bond layer; and
a second layer of grounding bond material on at least some portions of the shielding material.

14. The electronic module of claim 13 wherein the first layer of grounding bond material covers portions of the integrated circuit and portions of the first insulation layer, and wherein the layer of shielding material covers the first grounding bond layer, and wherein the second grounding bond layer covers the layer of shielding material.

15. A method of making an electronic module, comprising:
 - creating a redistributed surface on an integrated circuit, including
 - creating a redistribution layer comprising at least a layer of conductive redistribution material above at least some portions of a top face of the integrated circuit, which redistribution layer is electrically connected to the integrated circuit and includes conductive traces, mounting pads, and interconnect pads;
 - using at least some of the traces to position at least some of the interconnect pads along at least one edge of the redistributed surface;
 - creating a layer of insulation above at least some portions of the redistribution layer;
 - mounting at least one secondary component to at least one mounting pad;
 - securing the integrated circuit to a substrate, which substrate includes electrical traces, wherein at least one trace terminates along at least one edge of the substrate; and
 - electrically connecting at least one interconnect pad along at least one edge of the redistributed surface and at least one trace along at least one edge of the substrate, thereby electrically connecting the substrate to the integrated circuit.
16. The method of claim 15 further comprising electrically connecting additional components to the integrated circuit to form an electronics package of a microstimulator.
17. The method of claim 15 further comprising
 - providing a core comprising two separate halves;
 - securing one core half to the redistributed surface of the integrated circuit;
 - securing one core half to a portion of the substrate; and
 - winding a wire around the core halves to create a coil assembly.

18. The method of claim 17 wherein the core, when the two halves are assembled, is a dumbbell shape.

19. The method of claim 15 wherein the at least one secondary component is at least one of a diode, a capacitor, a power source, and a coil.

20. The method of claim 15 further comprising creating a first layer of insulation on at least some portions of the top face of the integrated circuit.

21. The method of claim 20 wherein creating the redistribution layer comprises:

creating a first layer of bond material on at least some portions of the integrated circuit;

creating a layer of conductive redistribution material on at least portions of the first bond layer; and

creating a second layer of bond material on at least some portions of the redistribution material.

22. The method of claim 21 wherein the first bond layer covers portions of the integrated circuit and portions of the first insulation layer, and wherein the conductive redistribution material covers the first bond layer, and wherein the second bond layer covers the redistribution material.

23. The method of claim 21 wherein the redistributed surface comprises at least one of copper, polyimide, gold, and titanium tungsten.

24. The method of claim 20 further comprising:
creating a grounding layer comprising at least a layer of shielding material above at least some portions of the integrated circuit.

25. The method of claim 24 wherein creating a grounding layer comprises:
creating a first layer of grounding bond material on at least some
portions of the integrated circuit;
creating a layer of shielding material on at least some portions of the
first grounding bond layer; and
creating a second layer of grounding bond material on at least some
portions of the shielding material.

26. The method of claim 25 wherein the first layer of grounding bond
material covers portions of the integrated circuit and portions of the first insulation
layer, and wherein the layer of shielding material covers the first grounding bond layer,
and wherein the second grounding bond layer covers the layer of shielding material.

27. The method of claim 15 wherein at least a portion of the post-
processing is performed on a wafer containing multiple integrated circuits.

28. A method of making an electronic module, comprising:
creating a first layer of insulation on at least some portions of a top
face of an integrated circuit;
creating a grounding layer comprising at least a layer of shielding
material above at least some portions of the first layer of insulation and above at
least some portions of the top face of the integrated circuit, which grounding layer is
electrically connected to the integrated circuit;
creating a second layer of insulation above at least some portions of
the grounding layer;
creating a redistribution layer comprising at least a layer of conductive
redistribution material above at least some portions of the second layer of insulation
and above at least some portions of the grounding layer, which redistribution layer is
electrically connected to the integrated circuit and the grounding layer, and includes
conductive traces, mounting pad, and interconnect pads; and

mounting at least one secondary component to at least one mounting pad.

29. The method of claim 28, further comprising
securing the integrated circuit to a substrate, which substrate includes
electrical traces, wherein at least one trace terminates along at least one edge of the
substrate; and
electrically connecting at least one interconnect pad along at least one
edge of the redistributed surface and at least one trace along at least one edge of
the substrate, thereby electrically connecting the substrate to the integrated circuit.
30. The method of claim 28 further comprising electrically connecting
additional components to the integrated circuit to form an electronic package of a
microstimulator.
31. The method of claim 28 wherein creating a grounding layer comprises:
creating a first layer of grounding bond material on at least some
portions of the integrated circuit;
creating a layer of shielding material on at least some portions of the
first grounding bond layer; and
creating a second layer of grounding bond material on at least some
portions of the shielding material.
32. The method of claim 31 wherein the first layer of grounding bond
material covers portions of the integrated circuit and portions of the first insulation
layer, and wherein the layer of shielding material covers the first grounding bond layer,
and wherein the second grounding bond layer covers the layer of shielding material.